## Abstract

The present work deals with the development of Nuclear Resonance Scattering of Synchrotron Radiation at the resonance of $^{121}$Sb (37.13 keV) and its application to high pressure studies. A new high energy resolution monochromator has been designed and tested in combination with a multielement detector in order to perform Nuclear Forward Scattering (NFS) experiments at very high pressure. Tests of the performance of the monochromator reveal an energy resolution of about 13 meV and a spectral efficiency of about 35 % at the resonance energy (37.13 keV) of $^{121}$Sb. High pressure experiments were performed on the ferromagnetic metallic compound MnSb (hexagonal NiAs-type structure), which exhibits a high Curie-temperature ($T_C \sim 580\,\mathrm{K}$) and a large magnetic moment ($\mu_{\mathrm{Mn}} \sim 3.5\,\mu_B$) aligned along the $c$-axis. It undergoes a spin reorientation below 520 K, where the direction of the Mn moments changes from the $c$ (easy)-axis to the $a$-axis. High pressure $^{121}$Sb NFS and x-ray diffraction measurements have been performed on MnSb up to about 30 GPa. The analysis of the experimental results reveals that the ferromagnetic state becomes unstable with increasing pressure up to 3 GPa. For $3\,\mathrm{GPa} \lesssim \mathrm{p} \lesssim 9\,\mathrm{GPa}$ we find a disordered magnetic state, while the NiAs-type structure remains unchanged. This disordered magnetic state is suggested to be driven by a change of the strength of the anisotropy of the the magnetic exchange interaction along the $a$-axis relative to that of the crystal field anisotropy along the $c$-axis. We further find a high pressure magnetic state which is connected with a structural phase transition from the NiAs-type to the MnP-type structure at about 10 GPa. This high pressure magnetic is suggested to be anisotropic, having the Mn moments aligned along the $c$-axis and exhibits a helimagnetic order.